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Mammals of Sugarite Canyon State Park, Colfax County, New Mexico

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Abstract

Little is known about the mammalian fauna of northeastern New Mexico. We conducted an inventory of mammals at Sugarite Canyon State Park, Colfax County, New Mexico, during summers of 2006 and 2007. The park is located on the Raton Mesa Group, a region of high-elevation habitat east of the Sangre de Cristo Range of the Rocky Mountains. Elevations within the park range from 1,890 to 2,536 m and dominant biotic communities include coniferous forests, montane grasslands, montane scrublands, coniferous woodland, and diverse riparian associations. We documented 40 species, of which seven were the first records for Colfax County: meadow jumping mouse (*Zapus hudsonius*), brown rat (*Rattus norvegicus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Yuma myotis (*Myotis yumanensis*), western small-footed myotis (*M. ciliolabrum*), cougar (*Puma concolor*), and red fox (*Vulpes vulpes*). The state-endangered New Mexico meadow jumping mouse (*Z. h. luteus*) was distributed widely and relatively abundantly in riparian habitats within the park. Another notable capture was an ermine (*Mustela erminea*), which is a species previously thought to be confined to the higher elevations of the main mass of the Rocky Mountains.

Key words: Colfax County, inventory, mammals, *Mustela erminea*, New Mexico, Raton Mesa, Sangre de Cristo Range, Sugarite Canyon State Park, survey, *Zapus hudsonius luteus*

Introduction

Sugarite Canyon State Park (SP) is located in northeastern New Mexico along the border of Colorado, approximately 10 km by road east of the city of Raton, Colfax County. The park is located on the Raton Mesa Group, which is a region of high-elevation habitat east of the Rocky Mountain foothills in southeastern Colorado and northeastern New Mexico. In this region, biotic communities of the Rocky Mountains and Great Plains interdigitate, resulting in high floral and faunal diversity (e.g., Dalquest et al. 1990). Sugarite Canyon SP has exceptional biological value because of its large size and diversity of habitats, and because it is one of the few areas of public land in northeastern New Mexico. The park area is approximately 14.6 km^2, including about 50 ha of surface water (NMSP 2006). The major topographic feature of the park is Sugarite Canyon.

Sugarite Canyon is bordered on the west by the Bartlett Mesa complex and on the east by the Barela-Horse Mesa complex. The highest elevation (>2,926 m) in the area is Fishers Peak Mesa in Las Animas County, Colorado. Fishers Peak Mesa and Barela Mesa form the northern border of the canyon. The highest point within Sugarite Canyon SP is on Little Horse Mesa at approximately 2,536 m (NMNRD 1984). Ecologically,

Sugarite Canyon SP is situated at an ecotone between coniferous forests and grasslands. Coniferous forests primarily occur at the northern end of the park and along north- and east-facing edges of high-elevation mesas. Most of the coniferous forest is dominated by ponderosa pine (*Pinus ponderosa*) with an understory of Gambel oak (*Quercus gambelii*). However, small patches of mixed coniferous forest dominated by Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) occur in cool microclimates, such as on north-facing slopes at the highest elevations. Occasionally, trees typical of the mixed coniferous forest zone occur lower into the ponderosa pine forest. Canyon slopes, especially in the southern half of the park, are montane scrublands dominated by oaks and New Mexico locust (*Robinia neomexicana*). A small area of piñon-juniper (*Pinus-Juniperus*) woodland mixed with oaks occurs near the southern border of the park (NMNRD 1984). Grasslands and scattered ephemeral ponds occur on the mesa tops. The park's geology is primarily basalt "caprock" over sandstone, with areas of developed soil, especially in valleys.

Sugarite Canyon is formed by Chicorica Creek, which flows southward through the park from Fishers Peak Mesa. The stream becomes intermittent at the southern park boundary. The lowest elevation in the park is approximately 1,890 m, where Chicorica Creek exits the park's southern border. Two dams on Chicorica Creek create artificial lakes that serve as part of the Raton Water Works. The largest, Lake Maloya (49 ha), has its northern arm in Colorado. Lake Alice (1.2 ha) is near the southern end of the park. There are two perennial tributaries to Chicorica Creek within the park. Segerstrom Creek flows from Fishers Peak Mesa in Colorado southeastward into the western arm of Lake Maloya. Soda Pocket Creek starts as two small tributaries on Bartlett Mesa and then flows eastward to Chicorica Creek.

Findley et al. (1975) reported records for only 20 species in eastern Colfax County, although distributional patterns documented in regional faunal monographs for New Mexico and Colorado suggest that the mammal diversity of this region should be much higher (Bailey 1931; Hill 1942; Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990; Fitzgerald et al. 1994). The mammalian fauna within Sugarite Canyon SP is even more poorly known; only two species, the meadow vole (*Microtus pennsylvanicus*) and porcupine (*Erethizon dorsatum*), previously were documented. NMNRD (1984) compiled a hypothetical list of mammals for Sugarite Canyon SP as part of the park feasibility study. However, the most relevant work related to the mammal fauna of Sugarite Canyon SP was Jones' (2002) 1995-1996 mammal survey of the James M. John and Lake Dorothey State Wildlife Areas, which are located adjacent to Sugarite Canyon SP in Las Animas County, Colorado, on Fishers Peak Mesa and in the upper portion of Sugarite Canyon. Jones' survey effort consisted of 709 trap-nights and documented 31 species of mammals.

One finding of particular importance was the discovery of a population of the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) in Sugarite Canyon (Jones 1999). This mammal is listed as a high-priority candidate for protection under the US Endangered Species Act and it will be proposed for listing in 2013. It also is listed as endangered by the state of New Mexico, sensitive by the US Forest Service Southwest Region and Bureau of Land Management, a species of special concern by Arizona, and it has a Natural Heritage conservation status of imperiled (S2) in Arizona and critically imperiled (S1) in Colorado and New Mexico. Surveys for this mammal in other mountain ranges in New Mexico during 2005 documented substantial declines in distribution and abundance, which sparked renewed concern for the species' conservation (Frey and Malaney 2009). Consequently, the goals of this study were to inventory riparian habitats within Sugarite Canyon SP to determine the occurrence of the New Mexico meadow jumping mouse and to survey other available habitats within Sugarite Canyon SP to document the mammalian fauna of the park. In June 2011 the Track Fire burnt 11,247 ha of the Raton Mesa Complex, including most of the basin of Chicorica Creek and most of Sugarite Canyon SP. Thus, this study provides important baseline information on the mammal communities prior to the wildfire.

MATERIALS AND METHODS

Field surveys occurred 10-14 July 2006, 22-24 July 2006, and 4-8 July 2007. We chose initial survey locations based on habitat potential for *Zapus h. luteus*, which consist of riparian areas dominated by tall, dense grasses, forbs, and sedges (*Carex*) associated with perennially moist to wet soil (Frey and Malaney 2009). Subsequent surveys focused on other habitat types or used other methods for documenting species not normally caught in Sherman traps.

Small terrestrial mammals were trapped using standard-size Sherman live-traps baited with horse sweet feed (i.e., three or four grains mixed with molasses). Traps were set in informal transects, ca. 0.5 to 2 m apart, depending on habitat complexity (i.e., traps were closer in more complex habitats). In riparian habitats traps were set near water and generally in tall, dense herbaceous vegetation. At the ponderosa pine forest site, two parallel transects were set along the topographical contour, with traps spaced ca. 5 to 6 m apart. Victor gopher traps were used to sample pocket gophers. Mist-nets were used to capture bats. We searched for mammals or their sign during daily activities and by using artificial lights at night. A handheld global positioning system unit (NAD 83) recorded each inventory location. Captured mammals were identified and either released at the capture location or prepared as voucher specimens consisting of skin, skeleton, and tissue samples. Specimens were deposited in the Museum of Southwestern Biology, University of New Mexico (MSB). Nomenclature, taxonomy, and phylogenetic order follow Wilson and Reeder (2005), except where noted. Subspecific classifications follow Frey (2004) except where otherwise noted.

Inventory Locations.—Small mammals were surveyed at 16 locations (Table 1) within Sugarite Canyon SP (Fig. 1).

1) Colorado border.—This location was in a small, unnamed drainage that flowed westward to Lake Maloya across NM Highway 526, 0.2 km south of the Colorado border. Traps were set in the drainage both below and above New Mexico Highway 526. Habitat at this site was unusual because it consisted of typical riparian species composition and structure, but in July 2006 there was no water or saturated soil. Riparian habitats consisted of dense stands of willow (*Salix*) with a sparse to dense herbaceous layer, patches of tall grasses and horsetail (*Equisetum*), and patches of dried sedges. Sparse grasses and ponderosa pine dominated adjacent uplands.

2) Segerstrom Creek.—Traps were set along Segerstrom Creek about 0.2 km upstream from its junction with Lake Maloya. There was a series of large beaver dams along the south side of the valley below our trapping location and a few smaller dams within our trapping area. The stream had a constant, but slow flow of clear water, with a substrate generally consisting of silt and mud. The stream became incised up to 1 m or more at the upstream edge of our survey area. Herbaceous riparian habitat was sparse to non-existent along the upstream, incised portion of the survey area. Where the stream gradient lessened and there was little incision, riparian habitats were well developed and generally dominated by dense stands of sapling willow with sparse to dense herbaceous groundcover of forbs, grasses, sedges, and rushes. There was often a narrow band of tall, dense sedges between the water and the willows. Where possible, traps were set in these and other patches of well-developed sedge.

3) Ponderosa pine forest.—Traps were set in a ponderosa pine forest located on the north-facing slope south of the junction of Segerstrom Creek with Lake Maloya. Habitat was dominated by ponderosa pine and scattered, mostly small diameter (<15 cm) Douglas-fir and white fir. Patches of small diameter (<15 cm) Gambel oak dominated the understory. Ground cover generally consisted of a thin layer of needles; there was little grass or forbs.

4) Segerstrom grassland.—Traps were set on vole (*Microtus*) runways in a large open meadow on a north-facing slope between the access road and the confluence of Segerstrom Creek and Lake Maloya. Ground cover consisted of tall (ca. 90 cm), dense grasses mixed with diverse forbs including yarrow (*Achillea millefolium*), mint (*Mentha*), Asteraceae, iris (*Iris missouriensis*), wild rose (*Rosa woodsii*), and mullein (*Verbascum thapsus*). Scattered currants (*Ribes*) provided additional

Table 1. Small mammal survey locations at Sugarite Canyon State Park, Colfax County, New Mexico, during 2006 and 2007. Descriptive localities are as reported on specimen tags. Location numbers refer to Figure 1.

No.	Name	Descriptive Locality	Coordinates: North Latitude	Coordinates: West Longitude	Elevation (m)	Dates Sampled	Trap-nights[1]
1	Colorado border	Sugarite Canyon State Park, drainage 0.1 mi S Colorado border on NM Hwy 526, 9.8 km N, 6.4 km E Raton	36 59.519	104 21.991	2310	22 - 23 July 06	117
2	Segerstrom Creek	Sugarite Canyon State Park, Segerstrom Creek, above junction with Lake Maloya, 9.6 km N, 5.1 km E Raton	36 59.434	104 22.866	2289	11 - 14 July 06	240
3	Ponderosa pine forest	Sugarite Canyon State Park, upland forest south of junction Segerstrom Creek and Lake Maloya, 9.5 km N, 5.2 km E Raton	36 59.355	104 22.802	2325	12 - 14 July 06	160
4	Segerstrom grassland	Sugarite Canyon State Park, upland grassland south of junction Segerstrom Creek and Lake Maloya, 9.6 km N, 5.3 km E Raton	36 59.375	104 22.735	2297	6 - 7 July 07	20
5	Upper Chicorica Creek	Sugarite Canyon State Park, Chicorica Creek, picnic area 0.4 mi S (by NM Hwy 526) Lake Maloya spillway, 8.4 km N, 5.6 km E Raton	36 58.762	104 22.532	2336	11 - 12 July 06	80
6	Rock cliff	Sugarite Canyon State Park, cliff along W side NM Hwy 526, 0.7 mi (by NM Hwy 526) S Lake Maloya spillway, 8.0 km N, 5.3 km E Raton	36 58.562	104 22.755	2187	12 - 14 July 06	80
7	Soda Pocket Creek	Sugarite Canyon State Park, small tributary to Soda Pocket Creek, 7.9 km N, 3.8 km E Raton	36 58.484	104 23.711	2404	11 - 12 July 06	80
8	Soda Pocket Campground	Sugarite Canyon State Park, Soda Pocket Campground, southern tributary to Soda Pocket Creek, 7.4 km N, 3.9 km E Raton	36 58.304	104 23.669	2391	10 - 13 July 06	87
9	Ponderosa Group Campground	Sugarite Canyon State Park, Ponderosa Group Campground, 7.5 km N, 4.6 km E Raton	36 58.267	104 23.253	2376	12 - 13 July 06	20
10	Upper end Lake Alice	Sugarite Canyon State Park, Chicorica Creek, upper end of Lake Alice, 6.0 km N, 4.7 km E Raton	36 57.458	104 23.118	2158	11 - 12 July 06; 22 - 23 July 06	118; 45
11	Valve Tender's House	Sugarite Canyon State Park, Valve Tender's House, above Lake Alice, 5.9 km N, 4.6 km E Raton	36 57.389	104 23.229	2183	7 - 8 July 07	8g

Table 1 (cont.).

No.	Name	Descriptive Locality	Coordinates: North Latitude	Coordinates: West Longitude	Elevation (m)	Dates Sampled	Trap-nights[1]
12	Lake Alice spillway	Sugarite Canyon State Park, Lake Alice dam spillway, 5.5 km N, 4.7 km E Raton	36 57.220	104 23.154	2175	5, July 07	bat
13	Chicorica Creek, below Lake Alice	Sugarite Canyon State Park, Chicorica Creek, below Lake Alice dam, 5.5 km N, 4.7 km E Raton	36 57.220	104 23.154	2175	22 - 23 July 06	82
14	Lower Chicorica Creek	Sugarite Canyon State Park, Chicorica Creek, 0.25 mi (by road) below Lake Alice dam, 5.1 km N, 4.8 km E Raton	36 57.026	104 23.091	2142	22 - 23 July 06	82
15	Mule Barn	Sugarite Canyon State Park, Mule Barn and park residences, 4.6 km N, 4.9 km E Raton	36 56.703	104 23.051	2301	6 - 8 July 07	90; bat
16	South border	Sugarite Canyon State Park, west side of NM Highway 526 on southern park boundary, 3.7 km N, 5.3 km E Raton	36 56.196	104 22.773	2140	4 - 7 July 07	237; 16g

[1] Trap-nights refer to use of Sherman traps. A small "g" refers to numbers of gopher trap-nights. "Bat" indicates the location was sampled for bats.

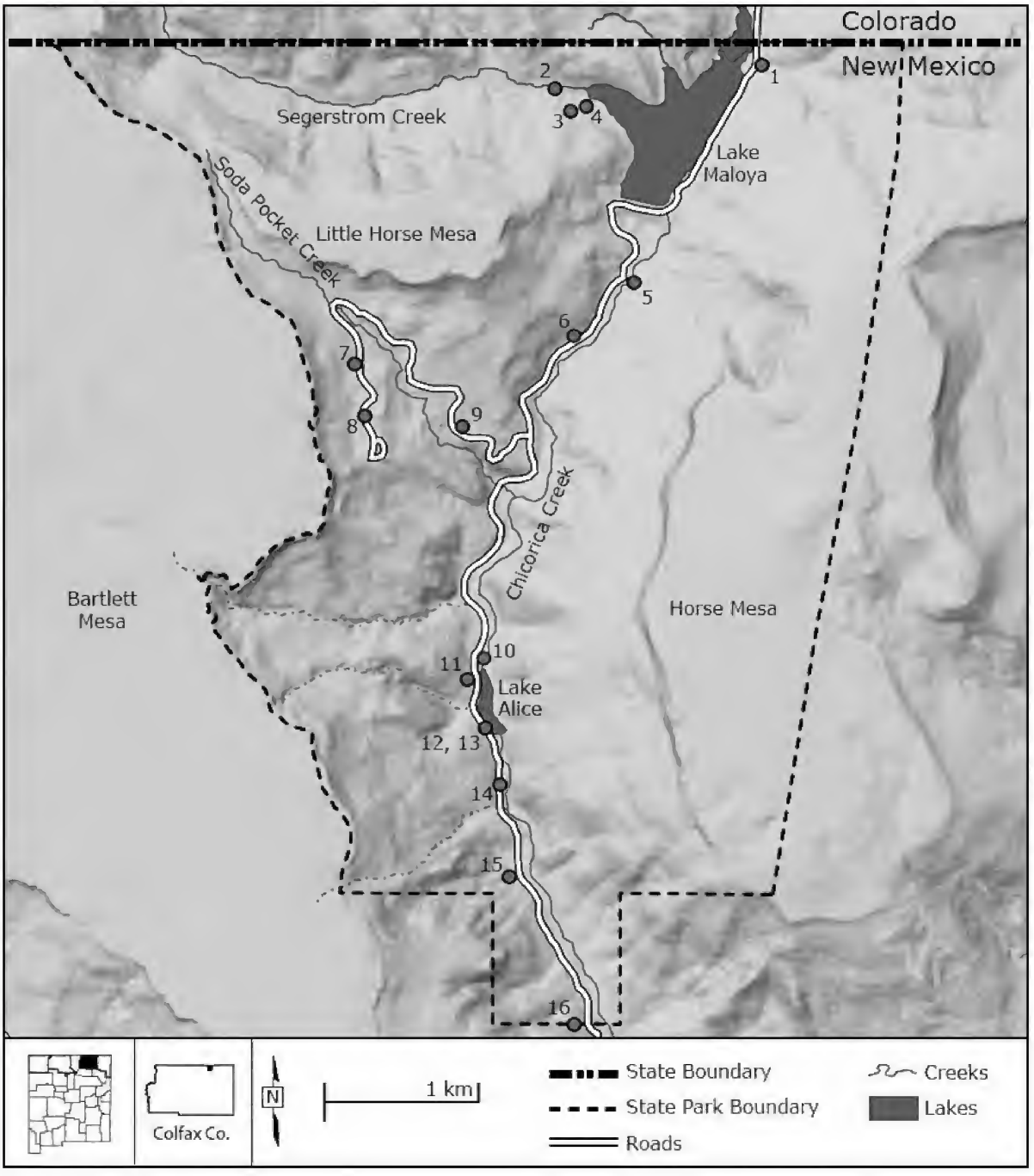

Figure 1. Map of mammal inventory locations at Sugarite Canyon State Park, New Mexico, during 2006 and 2007. Numbers refer to locations identified in Table 1.

cover. This area was surrounded by Gambel oak and ponderosa pine.

5) Upper Chicorica Creek.—Traps were set along Chicorica Creek at a small picnic area 0.6 km (by road) south of the access road gate on the west side of the Lake Maloya dam. Stream flow was consistent, but slow, generally with a substrate consisting of slab rock, boulders, and mud. The stream was slightly incised (<0.5 m), which precluded development of large patches of sedge. We did not see any active beaver sign, although there were old stumps that had been cut by beaver. The riparian zone was dominated by patches of coyote willow (*Salix exigua*) interspersed with New Mexico locust. Herbaceous ground cover was dominated by tall forbs, sedges, thistle (*Cirsium*), water hemlock (*Cicuta douglasii*), and sparse grass. Surrounding uplands consisted of ponderosa pine, Gambel oak, and New Mexico locust.

6) Rock cliff.—Traps were set in association with a steep east-facing slope with large rocks and rock cliffs along the west side of NM Highway 526, 1.1 km (by road) south of the access road gate on the west side of the Lake Maloya dam. Habitat was a successional-disturbance montane scrubland dominated by oaks and New Mexico locust. Other common plants included currant and virgins bower (*Clematis ligusticifolia*); ponderosa pine was scattered primarily at the top of the slope. There was little forb or grass.

7) Soda Pocket Creek.—Traps were set along a small stream located just north of the Soda Pocket Campground entrance and just south of the campfire programs area. The stream was narrow (<0.5 m), shallow, and exhibited little incision; the substrate was soil. Above the campground access road, the stream flowed through small open areas dominated by water hemlock, sedge, rush, grass, and forbs, and dense patches of willow edged with New Mexico locust. Below the campground access road, the stream flowed through an open meadow and the riparian zone consisted of tall, dense water hemlock and sedges, with occasional forbs such as mint. Adjacent uplands were dry and dominated by rush, grasses, and iris.

8) Soda Pocket Campground.—Sherman traps were set south of campsite number 16 along a small stream that crossed the Soda Pocket campground road. Riparian habitat along the stream was a diverse complex of patches of willow and alder (*Alnus*) with sparse forb understory, including cow parsnip (*Heracleum maximum*); linear patches of tall, dense forbs and grasses along the edge of the willow and alder; and, in open areas, hemlock with sporadic patches of sedge. There was a small meadow adjacent to the north side of the riparian zone that was dominated by wild licorice (*Glycyrhiza lepidota*), rose, iris, and other forbs. Upland habitat was dominated by Gambel oak. Gopher traps were set in the upland under and near Gambel oak.

9) Ponderosa Group Campground.—Traps were set adjacent to a covered group picnic shelter. New Mexico locust and a large ponderosa pine dominated habitat at this site. Most traps were set beside or on large boulders. Adjacent habitat included a dry upland meadow and ponderosa pine-Gambel oak forest.

10) Upper end Lake Alice.—Traps were set at the upper end of Lake Alice where Chicorica Creek entered the lake. Habitat was a marsh along the upper end of the lake and along edges of the lower portion of the stream, where it widened and the water became relatively still. This was the largest, most intact sedge complex observed in the park. Sediment along the stream was rock and soil and along the lake was soil. Habitat was dominated by tall sedges, but also contained water hemlock, patches of grasses, sapling willow, broad-leaf cattail (*Typha latifolia*), bulrush (*Scirpus cf. acutus*), cutleaf coneflower (*Rudbeckia laciniata*), black-eyed Susan (*Rudbeckia hirtua*), and various other forbs. Traps were set primarily in sedge-dominated habitats adjacent to water. Adjacent uplands had dry soil and were dominated by New Mexico locust and sparse spike rush (*Eleocharis*) and grasses.

11) Valve Tender's House.—This was a renovated historic building and the area around it was a primitive group picnic area. The substrate consisted of rich, dark soil, imported crush rock, and a light, coarse soil. New Mexico locust and sapling Gambel oak were the dominant shrub layer. There were areas of thick grass and understory. Trees included a few large elm (*Ulmus*) and scattered ponderosa pine, piñon, and juniper. Gopher traps were set at this location.

12) Lake Alice spillway.—Lake Alice is formed by an earthen dam on Chicorica Creek. The dam was ca. 4.5 m above the lake elevation. Adjacent canyon sides were steep and dominated by New Mexico locust. The concrete dam spillway was located on the extreme western end of the earthen dam. The width of the spillway was ca. 10 m and lake water flowed over most of this width. Concrete structures extended ca. 1.5 m above the water level on either side of the spillway and these, in conjunction with the canyon side and dam, formed a funnel across which a mist net was placed to capture bats.

13) Chicorica Creek, below Lake Alice.—Water flowed below the Lake Alice dam from the spillway and from an irrigation diversion ditch before merging as Chicorica Creek. Along both channels, stream flow was slow and the substrate was predominantly rocks and large boulders. Riparian habitats were dominated by dense willow. Herbaceous vegetation was sparse except for small patches of sedge and hemlock along the irrigation channel. Traps were set near water both along the irrigation channel and along the spillway overflow channel to the gauging station.

14) Lower Chicorica Creek.—Traps were set along Chicorica Creek, 0.25 miles (by road) below Lake Alice dam. Stream flow was slow and the substrate was predominantly large rocks and boulders. Dense willow thickets dominated riparian vegetation. Small patches of sedge and grass were present in open areas, but herbaceous vegetation was largely absent within dense willow thickets.

15) Mule Barn.—This location included a large barn, three houses, scattered small wooden ruins, and uninhabited recreational trailers. The barn was constructed of thick stone walls, wood rafters, and an un-insulated metal roof. Doors to the storage area normally were kept open, and mist nets were set in front of the north doors to capture bats. In addition, Sherman traps were set in the storage area, as well as around and in the basement of an older house constructed of stone and wood.

16) Southern border.—Sherman traps were set at the southern park boundary and west of New Mexico Highway 526 on a steep, east-facing hillside. Substrate was dry, loose dirt, and sandstone rocks covered in a loose litter layer of leaves and sticks with sparse grasses and forbs. The majority of ground cover consisted of Gambel oak, sumac (*Rhus*) and mountain-mahogany (*Cercocarpus montanus*). Trees included piñon pine and juniper, with scattered ponderosa pine. Gopher traps were set in mounds in deep soil along and near the roadside.

RESULTS

Total survey effort was 1,538 trap-nights with Sherman traps, including 931 trap-nights in riparian habitats and 607 trap-nights in upland habitats (Table 1). Additional survey effort included use of gopher traps, mist nets, and observations. This represented the most intensive mammal survey in the Raton Mesa region to date. Animals captured included 235 individuals of 15 species. In addition, another four species were documented by specimens collected by park staff and 21 species were documented by other means. Altogether, we documented 40 species of mammals from Sugarite Canyon SP (see "Documented Mammals" section for additional details on each species). Species documented by Jones (2002) in adjacent areas of Colorado, but not by us, included northern pocket gopher (*Thomomys talpoides*), Mogollon vole (*Microtus mogollonensis*), American water shrew (*Sorex palustris*), and long-legged myotis (*Myotis volans*); thus, a total of 44 species of mammals have been documented from the Sugarite Canyon area of the Raton Mesa.

The documented species included 12 that Jones (2002) considered to possibly occur in the region, including brush deermouse (*Peromyscus boylii*), white-footed deermouse (*P. leucopus*), rock deermouse (*P. nasutus*), North American porcupine (*Erethizon dorsatum*), mountain cottontail (*Sylvilagus nuttallii*), big brown bat (*Eptesicus fuscus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Yuma myotis (*Myotis yumanensis*), bobcat (*Lynx rufus*), red fox (*Vulpes vulpes*), western spotted skunk (*Spilogale gracilis*), and white-tailed deer (*Odocoileus virginianus*). Further,

we documented three species that Jones (2002) did not consider as potentially occurring in the region, including brown rat (*Rattus norvegicus*), ermine (*Mustela erminea*), and ringtail (*Bassariscus astutus*). Records presented herein for seven species are the first for Colfax County (i.e., meadow jumping mouse, brown rat, Townsend's big-eared bat, Yuma myotis, western small-footed myotis, cougar, red fox).

The Raton Mesa Group is an isolated region >2,591 m elevation dominated by upper montane (i.e., mixed coniferous forest) and associated biotic communities. These habitats are isolated from similar areas in the foothills of the Sangre de Cristo Mountains to the west by ca. 40 km of more arid, lower elevation habitats. Thus, species typically associated with mixed coniferous forest zones might be isolated on the Raton Mesa Group, including northern pocket gopher, American water shrew, dusky shrew (*Sorex monticolus*), and ermine. Further, several species typical of mixed coniferous and subalpine coniferous forests in the Sangre de Cristo mountains have not been documented from the Raton Mesa Group and might have been extirpated through natural processes associated with isolation, including golden-mantled ground squirrel (*Spermophilus lateralis*), western jumping mouse (*Zapus princeps*), bushy-tailed woodrat (*Neotoma cinerea*), western heather vole (*Phenacomys intermedius*), southern red-backed vole (*Myodes gapperi*), snowshoe hare (*Lepus americanus*), cinereus shrew (*Sorex cinereus*), and American marten (*Martes americana*). We disagree with MacCarter (1993) who reported seasonal occurrence of the yellow-bellied marmot (*Marmota flaviventris*); we found no reports of this species. We also disagree with Jones (2002) inclusion of golden-mantled ground squirrel, western jumping mouse, cinereus shrew, and cave myotis (*Myotis velifer*) on a list of possible species in the Sugarite Canyon area. However, we would add to the list of possible species: Virginia opossum (*Didelphis virginiana*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), silky pocket mouse (*Perognathus flavus*), eastern cottontail (*Sylvilagus floridanus*), Crawford's gray shrew (*Notiosorex crawfordi*), Merriam's shrew (*Sorex merriami*), dwarf shrew (*Sorex nanus*), and eastern pipistrelle (*Perimyotis subflavus*).

Based on Sherman trapping, the North American deermouse (*Peromyscus maniculatus*) was the most widely distributed and abundant species, accounting for more than half of the individuals captured (Table 2). This mouse was particularly abundant in disturbed habitats such as along lower Chicorica Creek. In contrast, other species were captured at few locations (≤36%) and, for most species overall relative abundances were very low (<1.0/100 trap-nights; Table 2). In part, this overall rarity reflects the differences in habitats sampled and the habitat specialization of most small mammals. Some of these species, such as the brush deermouse, while rare overall, were common at specific locations with unique habitat types. Three additional species were relatively common, including the meadow vole, long-tailed vole (*M. longicaudus*), and meadow jumping mouse. These three species primarily (voles) or exclusively (jumping mouse) occur in riparian areas. The remaining seven species were represented by only a few individuals, typically from just one or two locations (Table 2).

Small mammal species assemblages differed between riparian and upland habitats. Four species were captured only in riparian habitats: ermine, least chipmunk (*Tamias minimus*), western harvest mouse (*Reithrodontomys megalotis*), and meadow jumping mouse. In contrast, two species were captured only in upland habitats: brush mouse and Mexican woodrat (*Neotoma mexicana*). Small mammal communities in riparian habitats consisted of more species ($t = -2.087$, $df = 11.531$, $P = 0.060$) and there was a trend toward higher abundance (Table 2).

The meadow jumping mouse is listed as an endangered species in New Mexico, yet we captured 22 from five locations. Capture rates of meadow jumping mice in the Jemez and Sacramento mountains during 2005 averaged 1.1/100 trap-nights and ranged from 0.25-2.5/100 trap-nights (J.K. Frey, unpublished data). In comparison, at locations where jumping mice occurred within Sugarite Canyon SP, abundances exceeded that mean and in some instances were among the highest (e.g., 6.1and 6.9/100 trap-nights) ever reported for the species (Table 2).

Table 2. Capture rate using Sherman traps (captures per 100 trap-nights) and proportion of small mammals in riparian and upland habitat at Sugarite Canyon State Park, Colfax County, New Mexico, during 2006 and 2007.

			Species[1]													
No.	Name	Trap-nights	MUER	TAMI	REME	PEBO	PELE	PEMA	PENA	PE??	NEME	MILO	MIPE	ZAHU	Total	No. Species
Riparian																
1	Colorado border	117	0	0.9	0.9	0	0	10.3	0	0	0	0	0	0	12.0	3
2	Segerstrom Creek	240	0	0.4	0.8	0	0	4.6	0	0	0	1.7	6.7	1.7	15.8	6
5	Upper Chicorica Creek	80	0	0	0	0	0	3.8	0	0	0	5.0	0	1.3	10.0	3
7	Soda Pocket Creek	80	1.3	0	0	0	0	8.8	0	0	0	0	2.5	2.5	15.0	4
8	Soda Pocket Campground	87	0	0	0	0	0	6.9	0	0	0	3.4	0	6.9	17.2	3
10	Upper end Lake Alice	163	0	0	1.8	0	0	4.9	0	0	0	0	11.0	6.1	23.9	4
13	Chicorica Creek, below Lake Alice	82	0	0	0	0	0	29.3	0	0	0	0	0	0	29.3	1
14	Lower Chicorica Creek	82	0	0	0	0	1.2	32.9	2.4	0	0	2.4	0	0	39.0	4
	Total	931	0.1	0.2	0.6	0	0.1	10.5	0.2	0	0	1.4	3.9	2.5	19.5	
	Mean															3.5
Upland																
3	Ponderosa pine forest	160	0	0	0	0	0	2.5	0	0	0	0	0	0	2.5	1
4	Segerstrom grassland	20	0	0	0	0	0	0	0	0	0	0	20.0	0	20.0	1
6	Rock cliff	80	0	0	0	6.25	0	12.5	0	0	2.5	0	0	0	21.3	3
9	Ponderosa Group Campground	20	0	0	0	0	0	25	0	0	0	5.0	0	0	30.0	2

Table 2 (cont.).

No.	Name	Trap-nights	Species[1] MUER	TAMI	REME	PEBO	PELE	PEMA	PENA	PE??	NEME	MILO	MIPE	ZAHU	Total	No. Species
Upland (cont.)																
15	Mule Barn	90	0	0	0	0	0	0	0	0	2.2	0	0	0	2.2	1
16	South border	237	0	0	0	0.4	0.4	1.3	1.7	1.3	0	0	0	0	5.1	4
	Total	607	0	0	0	1.0	0.2	3.6	0.7	0.5	0.7	0.2	0.7	0	7.4	
	Mean															2.0
	Percent of locations captured		7	14	21	14	14	86	14	7	14	29	29	36		
	Overall relative abundance		0.07	0.13	0.39	0.39	0.13	7.80	0.39	0.20	0.26	0.91	2.60	1.50		

[1]MUER=*Mustela erminea*, TAMI=*Tamias minimus*, REME=*Reithrodontomys megalotis*, PEBO=*Peromyscus boylii*, PELE=*Peromyscus leucopus*, PEMA=*Peromyscus maniculatus*, PENA=*Peromyscus nasutus*, PE??=unidentified *Peromyscus*, NEME=*Neotoma mexicana*, MILO=*Microtus longicaudus*, MIPE=*Microtus pennsylvanicus*, ZAHU=*Zapus hudsonius*.

DOCUMENTED MAMMALS

ORDER RODENTIA
Family Sciuridae
***Sciurus aberti* Woodhouse 1853**
Abert's Squirrel

Abert's squirrels commonly are observed within Sugarite Canyon SP (R. Dye and P. Walsh, personal communication). Jones (2002) saw the species in the Colorado portion of Sugarite Canyon, and records are available from Colfax, Union, and Las Animas counties (Findley et al. 1975; Davis and Bissell 1989; Dalquest et al. 1990). However, we did not observe Abert's squirrels during our study. Drought conditions during the early 2000s resulted in a population crash in northern New Mexico, and numbers continued to be relatively low during 2005 and 2006 (J. K. Frey, unpublished data). We hypothesize that changes in forest structure that favor red squirrels (*Tamiasciurus hudsonicus*) could negatively impact *S. aberti*. These changes include loss of forest structure, consisting of well-spaced large-diameter trees, and invasion of trees typical of mixed coniferous forest (e.g., Douglas-fir and white fir) due to fire suppression and regeneration of a closed-canopy ponderosa pine forest. In Colorado, the range of *S. aberti* may have expanded, including into the Raton Mesa area (Davis and Bissell 1989). However, this seeming expansion could simply reflect the rarity of the species, population fluctuations, inadequate sampling, or even possibly transplants by humans. The subspecies is *S. a. ferreus*.

***Tamiasciurus hudsonicus* (Erxleben 1777)**
Red Squirrel

We observed three red squirrels eating immature ponderosa pine cones in treetops at the ponderosa pine forest site. In and near the ponderosa pine forest site, at least 17 middens were found, suggesting that red squirrels maintain resident populations in this forest. Jones (2002) reported this species from the Colorado portion Sugarite Canyon, and specimens have been reported from both Colfax and Las Animas counties (Armstrong 1972; Findley et al. 1975). The subspecies is *T. h. fremonti*.

***Spermophilus (Otospermophilus) variegates* (Erxleben 1777)**
Rock Squirrel

We saw rock squirrels on 6 July 2007 at the southern border of the park along New Mexico Highway 526. Jones (2002) observed this species in McBride and Sugarite canyons in adjacent Colorado, and records are available for Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Rock squirrels typically are associated with broken terrain and rocky habitats in virtually all vegetation zones within New Mexico. The subspecies is *S. v. grammurus*.

***Tamias minimus* Bachman 1839**
Least Chipmunk

Two species of chipmunk, the Colorado chipmunk (*Tamias quadrivittatus quadrivittatus*) and least chipmunk (*Tamias minimus operarius*), occur in northeastern New Mexico and southeastern Colorado. However, these species are often difficult to identify and verification usually requires comparative examination of series of specimens, including skull characteristics. We captured an adult female (MSB 140468) from near a roadway along a dry drainage at the Colorado border, and a juvenile male (MSB 140448) from a small beaver dam in a willow thicket at Segerstrom Creek. Measurements (mm) of MSB 140468 were: total length = 215, tail length = 97, hindfoot length = 32, ear length =17, dry ear length = 11, mass = 56 g, greatest length of skull = 33.16, zygomatic breadth = 18.77, cranial breadth = 16.56, interorbital breadth = 7.08, length of nasals = 10.14. Measurements of MSB 140448, the juvenile, were: total length = 203, tail length = 93, foot length = 31, ear length =17, dry ear length = 11, mass = 34 g. Based on nine measurements in Howell (1929), MSB 140468 was most similar to *T. m. operarius*, but it exceeded the range of variation for five measurements in *T. m. operarius* and was smaller than the range of variation for seven measurements in *T. q. quadrivittatus*. In most features the shape of the skull was similar to *T. m. operarius* (i.e., relatively delicate; cranium broad in relation to short rostrum), except

that the profile was somewhat flattened, as typical of *T. quadrivittatus*, rather than dome-shaped as typical of *T. minimus*.

Aspects of the pelage of MSB 140468 were consistent with *T. minimus*, including presence of five distinct blackish dorsal stripes, absence of a large and prominent white post-auricular patch, and buffy or yellowish undersides rather than whitish. However, in its overall grayish dorsal coloration, MSB 140468 appeared remarkably similar to a series in MSB identified as *T. quadrivittatus* from the Sandia Mountains. In contrast, the overall coloration of MSB 140448 was bright orange and lacked distinct, black, outer stripes. Rather, the outer stripes were broad and a deep rust color that almost totally lacked black hairs (a feature of *T. quadrivittatus*). A discriminant function analysis based on external measurements classified both specimens as *T. minimus*. Consequently, the preponderance of evidence suggests that both are referable to *T. minimus*. However, given the unusual features of these specimens, additional specimens are needed from the region so that a more comprehensive analysis can be conducted.

Jones (2002) reported capturing *T. minimus*, but no *T. quadrivittatus* in the Sugarite Canyon area in adjacent Colorado. *Tamias minimus* is known from throughout the Sangre de Cristo Mountains, and records are available from Las Animas and Colfax counties (Armstrong 1972; Findley et al. 1975). Typically, *T. minimus* is associated with open forests and mesic herbaceous areas, whereas *T. quadrivittatus* is associated with rocky areas. Thus, while not a riparian species per se, the capture of *T. minimus* from riparian areas is consistent with the biology of this species.

Family Geomyidae
***Thomomys bottae* (Eydoux and Gervais 1836)**
Botta's Pocket Gopher

In the Colorado portion of the Sugarite Canyon area, Jones (2002) documented two species of pocket gopher including *T. bottae* and the more common *T. talpoides*. We captured Botta's pocket gophers (MSB 140444, 140482, 140492) at three locations in Sugarite Canyon SP including: dark, loamy soil under Gambel oak trees in Soda Pocket Campground; the Valve Tender's House; and in a roadside ditch along New Mexico Highway 526 near the southern park border. Records of this species exist for Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *T. b. cultellus.*

Family Castoridae
***Castor canadensis* Kuhl 1820**
American Beaver

Several active and inactive beaver dams were observed along Segerstrom Creek just above its confluence with Lake Maloya. Old tree stumps cut by beaver were observed at upper Chicorica Creek, but there was no sign of recent activity. No beaver sign was observed below Lake Alice on Chicorica Creek. In July 2007 many of the beaver ponds on Segerstrom Creek that had been full in 2006 were empty. Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area. Specimens of beaver collected in 1955 in Colfax County are available in the collection at MSB but were not reported by Findley et al. (1975). On a geographic basis, the original subspecies might be referable to *C. c. concisor*, which is known from the upper Cimarron River watershed in New Mexico and the Rocky Mountain region of Colorado, or *C. c. texensis*, which is known from the lower Canadian River drainage in Texas (Armstrong 1972; Frey 2004). Subspecies designation must await collection and examination of series of specimens and an understanding of human introductions.

Family Dipodidae
***Zapus hudsonius* (Zimmermann 1780)**
Meadow Jumping Mouse

The meadow jumping mouse was the third most abundant species captured at Sugarite Canyon SP, in part because we targeted most survey efforts for this species during 2006. Overall relative abundance at sites where it was captured was 3.58/100 trap-nights, which was more than twice the average at all other locations where they were captured during 2005 and 2006 (Frey and Malaney 2009; J.K. Frey, unpublished data). Further, the species was captured at five riparian locations within Sugarite Canyon SP (Table 2). Of the locations with perennial water, the only sites where it was not captured were the two along Chicorica Creek

below Lake Alice. Water in this reach was discontinuous and there was poor development of the herbaceous riparian vegetation required by the species.

The best-developed herbaceous riparian habitat was at Lake Alice, which had a high relative abundance of jumping mice. There we captured nine mice on the night of 11 July 2006 in 118 traps. We resampled this location on the night of 22 July using 45 traps set at specific locations where jumping mice previously were captured. However, we only captured one jumping mouse, which was a recapture of one previously caught on the morning of 12 July. Captures at Soda Pocket Campground also suggested unusual spatial-temporal patterns of captures. A total of 29 traps were set on the night of 10 July 2006. No jumping mice were captured until the third night, when six jumping mice were captured. Other researchers also have noted similar clustered captures and have suggested explanations including wandering behavior and weather-related activity. Jones (1999, 2002) captured this species on the Lake Dorothey State Wildlife Area in 1996. The subspecies is *Z. h. luteus* (Jones 1999; Malaney et al. 2012), which is listed as endangered in New Mexico and is a high priority candidate for listing on the federal Endangered Species Act.

Family Cricetidae

***Microtus longicaudus* (Merriam 1888)**

Long-tailed Vole

The long-tailed vole was one of the most common species (Table 2). This species typically is associated with shrubby riparian habitats within the mixed coniferous forest zone. Most captures during this study were in riparian habitats, including Segerstrom Creek, upper Chicorica Creek, Soda Pocket Campground, and lower Chicorica Creek. However, we also captured one at the Ponderosa Group Campground in the cool shade and moist soil beside the group picnic structure. Abundance of long-tailed voles in forested habitats in Sugarite Canyon SP likely is much lower than in riparian habitats. Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area, and records have been reported from the Sangre de Cristo Mountains in western Colfax County and Sierra Grande in Union County (Findley et al. 1975; Hubbard et al. 1983). The subspecies is *M. l. longicaudus.*

***Microtus pennsylvanicus* (Ord 1815)**

Meadow Vole

The meadow vole was the second most abundant species captured, although it was captured at only four locations, including Segerstrom Creek, Segerstrom grassland, Soda Pocket Creek, and Lake Alice. This species typically is associated with wet, graminoid habitats. However, we also captured it in a drier upland grassland (i.e., Segerstrom grassland), where additional tall cover was provided by forbs and shrubs. Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area. In addition, 14 specimens (MSB 89307-89310, 89690-89693, 92622-92627) of this species were collected from Soda Pocket Campground in 1992. Other records are available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Hubbard et al. 1983). The subspecies is *M. p. modestus.*

***Ondatra zibethicus* (Linnaeus 1766)**

Common Muskrat

On the bank of the western arm of Lake Maloya at the confluence of Segerstrom Creek (near Segerstrom Creek site), we found a dead muskrat and saw another emerging from a burrow in the bank and swimming in the lake shallows. We also observed this species and its large runways through the sedges at Lake Alice. Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area and information is available from Colfax and Union counties (Best 1971; Findley et al. 1975). On a geographic basis, the subspecies is probably *O. z. osoyoosensis*, which is known from the upper Canadian River watershed; however, a series of specimens is needed to verify subspecies (Frey 2004).

***Reithrodontomys megalotis* (Baird 1857)**

Western Harvest Mouse

The western harvest mouse was an uncommon species captured at three riparian locations, including the Colorado border, Segerstrom Creek, and Lake Alice. The primary habitat requirement for this species is tall, dense herbaceous vegetation, which often (but not always) is afforded by ungrazed riparian areas. Jones

(2002) documented this species from the Colorado portion of the Sugarite Canyon area, and specimens are known from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *R. m. aztecus*.

Neotoma mexicana Baird 1855
Mexican Woodrat

Mexican woodrats were captured at two locations including the rock cliff site, where woodrat nests and scat were observed in rock crevices, and the basement of a house at the Mule Barn. In Union County and adjacent areas of Oklahoma and Texas, Mexican woodrats tended to be associated with igneous formations, whereas white-throated woodrats (*Neotoma leucodon*; formerly referred to *N. albigula*) were associated with sandstone (Dalquest et al. 1990). Habitats include montane scrublands, piñon-juniper woodlands, and conifer forests (Fitzgerald et al. 1994). Jones (2002) documented this species in Gambel oak scrubland from the Colorado portion of the Sugarite Canyon area, and records have been reported from throughout much of Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *N. m. scopulorum*.

Peromyscus boylii (Baird 1855)
Brush Deermouse

Three species of deer mice occur in northeastern New Mexico and southeastern Colorado that have relatively long, tufted tails and absence of a prominent lower incisor-base capsule, including the brush mouse (*Peromyscus boylii*), northern rock mouse (*P. nasutus*), and piñon mouse (*P. truei*). These species can pose difficult identification problems, particularly in absence of large series of specimens and suitable comparative material. We collected a total of 11 specimens possessing long, tufted tails and absence of a prominent lower incisor-base capsule. Six of these, including all five mice (MSB 140438 – 140440, 140449, 140450) collected from the rock cliff site and one (MSB 140480) collected from the southern border site, formed a fairly uniform group characterized by the following: small auditory bullae; a diamond-shaped interparietal having a triangular anterior-pointed apex at the anterior midline (rather than the anterior edge being flat or posteriorly concave); absence of a prominent anterioconid groove (except in one) and stylids (except in two) on the first lower molar; a short-appearing rostrum with most having rostral length <9.8 (rather than most >10.0); greatest length of skull <27.5 (rather than ≥28); total length of most <186 (rather than most >188); tail averaging 87 (rather than 93); hindfeet <22.5 (rather than >22.5); ear ≤20.5 (rather than >21); mass averaging 23 (rather than 25); and most having dark pelage extending beyond the ankle on the dorsal surface of the hindfeet. We referred these specimens to *P. boylii*. However, tail length varied within this group from 87% to 110% of the head and body length, rather than being consistently longer as is often given as a key character for *P. boylii*.

Although included on Jones' (2002) list of possible species, these specimens provide the first documentation of the species in the Sugarite Canyon area. *P. boylii* is typical of Gambel oak montane scrublands, especially in associations with rocks (Fitzgerald et al. 1994). However, Dalquest et al. (1990) reported that it also used brushy habitats in the absence of rocks. Other records exist for Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *P. b. rowleyi*.

Peromyscus maniculatus (Wagner 4845)
North American Deermouse

The North American deermouse was the most common and widely distributed mammal at Sugarite Canyon SP, and at some locations was the only species captured (Table 2). Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area, and it is known from throughout Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Three subspecies occur in vicinity of Sugarite Canyon SP, including *P. m. rufinus*, which occurs in coniferous forest areas, *P. m. nebrascensis*, which occurs on the central High Plains of Colorado, and *P. m. luteus*, which occurs on the southern High Plains in New Mexico (Frey 2004). Previously, specimens from the Sugarite Canyon area and western Union County were referred to *P. m. rufinus*, although those from western Union County were noted to be slightly smaller and paler than typical members of this subspecies (Dalquest et al. 1990; Jones

2002). Our series of specimens exhibited tremendous variation and additional study is needed to understand subspecies limits in this region.

***Peromyscus leucopus* (Rafinesque 1818)**
White-footed Deermouse

An adult female (MSB 140459) captured at the lower Chicorica Creek site was verified as *P. leucopus*. External measurements (mm) were total length = 190, tail length = 86, hindfoot length = 23, ear length = 20, mass = 36 g. Identification was based on the following characteristics: uniformly dull pale grayish brown upperparts lacking any lateral orange coloration; short, indistinctly bicolored, terete tail; large white feet lacking any grayish color; small, pale ears; large body and skull relative to *P. maniculatus*; short broad skull with small bullae; prominent lower incisor-base capsule; and lack of an anterioconid groove, stylids, or lophids on the first lower molar (see Cornely et al. [1981] and Dalquest and Stangl [1983] for cranial characters). *Peromyscus leucopus* often is associated with low-elevation riparian and grassland habitats, although Dalquest et al. (1990) reported it from a variety of low-elevation habitats in Union County. Our specimen provided the first documentation of this species in the Sugarite Canyon area, although Jones (2002) included it in a list of possible species. Other records are available for Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *P. l. tornillo.*

***Peromyscus nasutus* (Allen 1891)**
Northern Rock Deermouse

An adult male (MSB 140488) trapped at the southern border site was immediately recognizable in the field as *P. nasutus* by its large size, large hind feet, large ears that were not longer than the hind feet, and distinctive, uniformly gray upperparts with a hint of orange along the flanks. External measurements (mm) were: total length = 195, tail length = 96, hind foot length = 23.5, ear length = 23.5, and mass = 24 g. Supporting characters included moderately inflated auditory bullae; an oblong interparietal with the anterior edge posteriorly concave; presence of a deep anterioconid groove and stylids on the first lower molar; rostrum appearing long and narrow, rostral length = 10.31 mm; and greatest length of skull = 28.01 mm (see Cornely et al. [1981] and Dalquest and Stangl [1983] for cranial characters).

Examination of 11 *Peromyscus* specimens having relatively long, tufted tails and absence of a prominent lower incisor-base capsule, indicated that four additional specimens were referable to *P. nasutus*. These included a second specimen from the southern border site (MSB 140479), two from lower Chicorica Creek (MSB 140454, 140456), and one that had been killed by a cat near the Mule Barn (MSB 140470). Together, the five specimens had the following characteristics (all measurements in mm) that distinguished them from *P. boylii*: moderately inflated auditory bullae (rather than slightly inflated); an interparietal with flat or posteriorly concave anterior edge (rather than having an anteriorly-directed triangular apex); presence of a deep anterioconid groove and stylids on the first lower molar (rather than absent); a rostrum appearing long and slender, with most having rostral length >10.0 (rather than most <9.8); greatest length of skull ≥28 (rather than ≤27.5); total length of most >188 (rather than most <186); tail averaging 93 (rather than 87); hindfeet ≥22 with most ≥23 (rather than ≤22); ear ≥21 (rather than ≤21 and most ≤20); mass averaging 25 g (rather than 23 g); and most lacking dark pelage extending beyond the ankle onto the dorsal surface of the hindfoot.

Only MSB 140488 had the grayish dorsal pelage that normally is characteristic of *P. nasutus*; the others had a brownish dorsal pelage. One brown mouse (MSB 140456) from Lower Chicorica Creek had exceptionally long hindfeet and ears and initially was identified as *P. truei*. External measurements (mm) of FT 578 were total length = 188, tail length = 93, hind foot length = 25, ear length = 25, and mass = 25 g. We refer MSB 140456 to *P. nasutus* on basis of moderately inflated bullae (rather than appearing greatly inflated), long tail (98% of head and body length), hindfoot ≥ ear length, presence of a deep anterioconid groove and stylids on the first lower molar (in *P. truei* most lack the groove and stylids; see Schmidly [1973]; Cornely et al. [1981]; Dalquest and Stangl [1983]).

The five specimens of *P. nasutus* from Sugarite Canyon SP differed from descriptions of the species in adjacent areas. Dalquest et al. (1990) reported that

specimens referred to *P. nasutus* in Union County and adjacent areas of Oklahoma and Texas always had tail length >100 mm. Similarly, Fitzgerald et al. (1994) stated that Colorado *P. nasutus* had a tail length slightly longer than the head and body, and ear length <22 mm and ≤ hindfoot length. In contrast, none of ours had a tail length >97 mm, and tail length ranged from 90-103% of the head and body length. Further, ear length in our series had a mean = 22.5 mm, a range of 21-25 mm, and was ≤ hindfoot length.

Jones (2002) included *P. nasutus* in a list of possible species in the area, and our records confirm its presence. It is known from Colfax, Union, and Las Animas counties where it is associated primarily with rocky areas at mid elevations, especially in montane scrublands, piñon-juniper woodlands, and ponderosa pine forest (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *P. n. nasutus*.

Family Muridae
***Rattus norvegicus* (Berkenhout 1769)**
Brown Rat

Distribution of the brown rat is poorly documented and there are no specimens from Colfax, Union, or Las Animas counties. However, it has been reported to be broadly distributed in association with urban and agricultural areas throughout the lower elevations of Colorado and New Mexico (Miller and Doll 1967; Fitzgerald et al. 1994). This non-native rat formerly occurred in association with older buildings within Sugarite Canyon SP, including the Mule Barn and a residence area below Lake Maloya dam, but control efforts might have eliminated it from the park (B. Dye, personal communication).

Family Erethizontidae
***Erethizon dorsatum* (Linnaeus 1758)**
North American Porcupine

We observed the distinct fecal pellets of porcupine at the southern border site. Jones (2002) reported sign that appeared to be attributed to porcupine (bark missing from trees) as evidence for inclusion in the faunal list for the Sugarite Canyon area. We located a specimen (MSB 57637) obtained in 1986 from Sugarite Canyon SP that confirms the presence of this species. Other records are available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Porcupines are probably most common in rugged areas and canyons within coniferous forest, woodland, and scrubland associations, although on occasion they occur on relatively level terrain, far from any trees. The subspecies is *E. d. epixanthum*.

ORDER LAGOMORPHA
Family Leporidae
***Sylvilagus nuttallii* (Bachman 1837)**
Mountain Cottontail

Jones (2002) documented cottontails from the Colorado portion of the Sugarite Canyon area but was unable to confirm identification. We obtained an adult female, road-killed cottontail (MSB 140494) from New Mexico Highway 525, 2.4 miles (by road) north of the Mule Barn in December 2006. Measurements (mm) were total length = ca. 365, tail length = ca. 35, hindfoot length = 96, ear length = 63, mass = 915 g. The skull was crushed, which precluded evaluation of several diagnostic characters. However, it was identified as *S. nuttallii* based on the following characters: hindfoot to ear ratio = 1.5, which is typical of *S. nuttallii* but larger than for *S. floridanus* and *S. audubonii*; the relationship between the mandibular alveolar toothrow length (13.26 mm) and the depth of the dentary at the fourth premolar (10.20 mm), which was within the range for *S. nuttallii* but not *S. floridanus* and *S. audubonii*; the lower premolar had a smooth enamel border with no hint of crinkling; the pelage was a rich, dark rusty brown, and the interior of the ears were well-furred (see Findley et al. [1975] for description of mensural characters). Cottontails were observed along roads and in open areas that had been mowed near Lake Alice and Soda Pocket Campground. Specimens of *S. nuttallii* also are known from elsewhere in Colfax and western Union counties (Findley et al. 1975; Dalquest et al. 1990). Habitats include coniferous forests and montane scrublands. In western Union County, Dalquest et al. (1990) speculated that *S. audubonii* might have invaded areas previously occupied by *S. nuttallii*. The subspecies is *S. n. pinetis*.

ORDER SORICOMORPHA
Family Soricidae
***Sorex monticolus* Merriam 1890**
Dusky Shrew

We obtained an adult male shrew (MSB 140469) that was killed by a domestic cat in the vicinity of the Mule Barn. Measurements (mm) were: total length = 108, tail length = 43, hindfoot length = 12, ear length = 6, greatest length of skull = 17.79, condylobasal length = 17.53, and mass = 6 g. At least six species of long-tailed shrew potentially occur in the Sugarite Canyon area. The specimen was identified as a member of the subgenus *Otisorex* (and thereby excluding from consideration *S. merriami*) by absence of the post-mandibular canal and presence of pigmented ridges extending lingually along cusps of each unicuspid (Junge and Hoffmann 1981). In this specimen the third and fourth unicuspid appeared equal in size, perhaps due to the extremely worn nature of the teeth. The specimen was identified as *S. monticolus* based on its large size (both externally and cranially), which exceeded the range of variation for *S. cinereus*, and its pelage color, which was indistinguishable from other New Mexico *S. monticolus* in the MSB. In contrast, New Mexico *S. cinereus* had a deep brown dorsum lacking any hint of gray and grayish buff underparts.

Jones (2002) documented the dusky shrew from the Colorado portion of the Sugarite Canyon area. It also has been reported from the Sangre de Cristo Mountains in western Colfax County, but not further east into Union County (Findley et al. 1975; Dalquest et al. 1990). This species occurs within the coniferous forest zones, where it typically is associated with mesic habitats such as riparian associations and aspen stands (Fitzgerald et al. 1994). The subspecies is *S. m. obscurus*.

ORDER CHIROPTERA
Family Vespertilionidae
***Eptesicus fuscus* (Beauvois 1796)**
Big Brown Bat

We captured a male (MSB 14048) in a mist-net at the north entrance of the Mule Barn. Jones (2002) included this bat on a list of possible species in the area, and specimens are available for other areas of Las Animals and Colfax counties (Armstrong 1972; Findley et al. 1975). In New Mexico, this bat is most common in ponderosa pine forest (Findley et al. 1975). In pelage color, our specimen more closely resembled specimens from the Great Plains rather than specimens from the Rocky Mountains. Thus, it might be referable to *E. f. fuscus*. Previously, Dalquest et al. (1990) referred specimens from Union County, New Mexico and adjacent areas in Oklahoma and Texas to this subspecies.

***Corynorhinus townsendii* (Cooper 1837)**
Townsend's Big-eared Bat

We captured a male (MSB 140484) in a mist-net set across the north entrance of the Mule Barn. Jones (2002) included this bat on a list of possible species in the area, and it previously was reported from Union and Las Animas counties (Armstrong 1972; Dalquest et al. 1990). However, this appears to be the first record from Colfax County. It is known from both low and high elevations throughout Colorado and New Mexico (Armstrong 1972; Findley et al. 1975). Presence of suitable roosts (e.g., caves, mines, rock shelters) is considered necessary for the species (Findley et al. 1975). The subspecies is *C. t. pallescens*, although in pelage our specimen more closely resembled those from the Great Plains rather than the Rocky Mountains.

***Myotis yumanensis* (Allen 1864)**
Yuma Myotis

We captured the Yuma myotis at the Lake Alice spillway (MSB 140483) and the Mule Barn (MSB 140486, 140487). Jones (2002) included this bat in a list of possible species in the area and it previously was reported from Union County (Findley et al. 1975; Dalquest et al. 1990). However, this appears to be the first record from Colfax County. In Union County, this was considered the most common species in the piñon-juniper zone (Dalquest et al. 1990), and Findley et al. (1975) associated it with perennial water.

***Myotis ciliolabrum* Merriam 1886**
Western Small-footed Myotis

A bat carcass (MSB 140481) found at the Lake Alice Campground was identified as *M. ciliolabrum* based on presence of a keeled calcar and single upper premolar, relatively large size, short black ears, and bright brown dorsal pelage (Bogan 1974; Findley et al. 1975). Jones (2002) captured this bat on the Sugarite Ski Resort building in 1995, and it has been documented from other areas in Las Animas County (Armstrong 1972). However, this appears to be the first record from Colfax County. In New Mexico, the western small-footed myotis usually is associated with ponderosa pine forest, although it might occur at both higher and lower elevations (Findley et al. 1975).

ORDER CARNIVORA
Family Felidae
***Lynx rufus* (Schreber 1777)**
Bobcat

We observed a bobcat 1.3 km north of the Sugarite Canyon SP visitor center along New Mexico Highway 526. Although included on Jones' (2002) list of possible species, this observation provides the first documentation of the species in the Sugarite Canyon area. Additional records are available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *L. r. texensis*.

***Puma concolor* (Linnaeus 1771)**
Cougar

Cougars are observed on a regular basis throughout the park (R. Dye, personal communication). Jones (2002) also reported observations of cougars in the vicinity of Sugarite Canyon. Specific records of mountain lions are sparse (particularly in the form of specimens), and these observations represent the first such from Colfax County. Dalquest et al. (1990) reported that a series of skulls purchased from a hunting guide were supposedly from Colfax and Union counties and adjacent areas of Colorado. Three subspecies have range limits near Sugarite Canyon SP, including *P. c. azteca* from the Rocky Mountains and western areas of New Mexico, *P. c. stanleyana* from the eastern plains of New Mexico, and *P. c. hippolestes* from Colorado. Specimens and additional study will be required to understand subspecies relationships.

Family Canidae
***Vulpes vulpes* (Linnaeus 1758)**
Red Fox

A red fox was observed near the park entrance in piñon-juniper habitat (R. Dye, personal communication). Jones (2002) included the red fox on a list of possible species in the area. Red foxes have an uncertain status and distribution in New Mexico. Two subspecies occur in the state: *V. v. macroura* from central and western New Mexico, including the Sangre de Cristo Mountains (Armstrong 1972; Findley et al. 1975), and *V. v. fulva* in the grassland plains of eastern New Mexico and adjacent areas (Dalquest et al. 1990; Frey 2004). Previously, it was thought that *V. v. fulva* was introduced from Europe (Kamler and Ballard 2002), and that it has displaced native red foxes in some areas of North America (e.g., Perrine et al. 2007). However, recent studies have confirmed that *V. v. fulva* is native to the United States, although it has expanded its range (Statham et al. 2012; Frey in press). A red fox specimen from Union County is of unknown subspecies (Kamler et al. 2005). Although Frey (2004) included Colfax County within the known range of the species, the observation reported here is the first specific record of this species in the county. The status (including subspecies designation) of red foxes should be documented in Sugarite Canyon SP and adjacent areas.

***Canis latrans* Say 1823**
Coyote

Coyotes occur in Sugarite Canyon SP, but observations are infrequent (R. Dye, personal communication). Jones (2002) observed coyotes in the Sugarite Canyon area of adjacent Colorado. Coyotes occur throughout New Mexico and Colorado at all elevations and habitats, with specimens available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990; Fitzgerald et al. 1994; Frey 2004). Without comment, Dalquest et al.

(1990) referred all specimens from Union County and adjacent areas of Oklahoma and Texas to *C. l. latrans*, the subspecies of the northern and central Great Plains. However, *C. l. lestes* is known from the Rocky Mountains (Armstrong 1972; Hall 1981). Additional study based on examination of specimens will be required to assign subspecies.

***Urocyon cinereoargenteus* (Schreber 1775)**
Gray Fox

We observed a gray fox at the Mule Barn. Jones (2002) saw gray foxes within the Sugarite Canyon area in Colorado, and records are available from Colfax and Union counties (Findley et al. 1975; Dalquest et al. 1990). The species occurs throughout New Mexico and is associated with a variety of habitats, including grasslands, coniferous forest, and especially woodlands in broken terrain (Findley et al. 1975; Frey 2004). The subspecies is *U. c. scottii*.

Family Mustelidae
***Mustela erminea* Linnaeus 1758**
Ermine

We unexpectedly captured an ermine at Soda Pocket Creek (MSB 140418). In the Southern Rocky Mountains, ermine are rare and typically associated with wet meadow habitats within mixed coniferous and subalpine forests (Findley et al. 1975; Fitzgerald et al. 1994). Neither Armstrong (1972) nor Fitzgerald et al. (1994) reported records from the Colorado portion of the Sangre de Cristo Mountains and Jones (2002) did not include it in her list of possible species. However, the species is known from the higher elevations of the Sangre de Cristo Mountains, including western Colfax County (Findley et al. 1975). The Sugarite Canyon SP record is approximately 45 km ENE of the nearest record in the Sangre de Cristo Mountains and in a vastly different vegetation zone (i.e., montane scrubland) than previous records in New Mexico (upper mixed and subalpine coniferous forests). Ermine on the Raton Mesa Group likely are isolated from those in the Sangre de Cristo Mountains. The subspecies is *M. e. murices*.

***Mustela frenata* Lichtenstein 1831**
Long-tailed Weasel

We observed two juvenile and one adult long-tailed weasel in Soda Pocket Campground. The trio was observed climbing a large Gambel oak, excavating a pocket gopher burrow, and engaging in play behavior. Jones (2002) observed this species in the Colorado portion of the Sugarite Canyon area. Long-tailed weasels probably occur throughout Colfax, Union, and Las Animas counties in areas of high prey abundance, although specimens and reports are few (Best 1971; Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *M. f. nevadensis*.

***Taxidea taxus* (Schreber 1777)**
American Badger

A hunter killed a badger on Little Horse Mesa around 1985 (R. Dye, personal communication). Jones (2002) reported observations of badgers in the Sugarite Canyon area in Colorado and the species has been documented in Colfax and Union counties, New Mexico (Findley et al. 1975). Badgers use a variety of habitats but are most common in grasslands and meadows, where there is an abundance of burrowing rodents. The subspecies is *T. t. berlandieri*.

Family Ursidae
***Ursus americanus* Pallas 1780**
American Black Bear

We observed a black bear 0.2 km south of the Sugarite Canyon SP visitor center in an open meadow near the coal camp ruins. Jones (2002) reported this species in the Colorado portion of the Sugarite Canyon area. Black bears occur throughout much of the wooded areas of Colfax, Union, and Las Animas counties, although there are few specimen records (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Dalquest et al. (1990) reported that a series of skulls purchased from a hunting guide were supposedly from Colfax and Union counties and adjacent areas of Colorado. The subspecies is *U. a.* amblyceps.

Family Mephitidae
***Mephitis mephitis* (Schreber 1776)**
Striped Skunk

We saw striped skunks at several locations, including a willow thicket with a dense forb layer at the Colorado border site, along the Soda Pocket Campground access road in Soda Pocket Canyon, Soda Pocket Campground, and near the Lake Alice Campground (vicinity of Upper end Lake Alice site). Jones (2002) found this species in the Colorado portion of the Sugarite Canyon area, and specimens are available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Two subspecies are known from the vicinity of Sugarite Canyon SP, including *M. m. hudsonica*, which is associated with the mountains, and *M. m varians*, which is associated with the eastern grasslands (Frey 2004). Specimens will be required to confirm subspecies.

***Spilogale gracilis* Merriam 1890**
Western Spotted Skunk

A western spotted skunk was a common visitor to our camp in Soda Pocket Campground. The visits were made both day and night, and the skunk often was observed digging in the leaf litter under Gambel oak. Although included on Jones' (2002) list of possible species, our observations provide the first documentation of the species in the Sugarite Canyon area. Findley et al. (1975) reported specimens from Colfax and Union counties, although Dalquest et al. (1990) considered it uncommon in Union County. It typically is associated with rocky and brushy areas (Findley et al. 1975). The subspecies is *S. g. gracilis*.

Family Procyonidae
***Bassariscus astutus* (Lichtenstein 1830)**
Ringtail

Ringtails have been observed along Chicorica Creek near the southern park boundary and near the residence at the base of the Lake Maloya dam (R. Dye, personal communication). The ringtail is known from throughout most of New Mexico and southern Colorado, with specimens from Colfax County (Findley et al. 1975; Fitzgerald et al. 1994). The species primarily is associated with broken terrain and canyons at moderate elevations, especially in areas dominated by montane scrublands and piñon-juniper woodland. Thus, Sugarite Canyon SP seems ideally suited for the species. Jones (2002) did not include this on a list of possible species in the area. The subspecies is *B. a. flavus*.

***Procyon lotor* (Linnaeus 1758)**
Raccoon

We observed raccoon tracks along the banks of Lake Maloya and in the Mule Barn. Although raccoons frequent riparian areas, they do not occur exclusively in these habitats and could be found anywhere in the park. Jones (2002) documented this species from the Colorado portion of the Sugarite Canyon area and specimens are available from Colfax, Union, and Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). The subspecies is *P. l. hirtus*.

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Family Cervidae
***Odocoileus hemionus* (Rafinesque 1817)**
Mule Deer

Mule deer were common in Sugarite Canyon SP. We observed mule deer at several locations including 1.4 km north (by New Mexico Highway 526) of the Lake Maloya dam, in an open area 0.2 km east of the Lake Maloya spillway, in a small meadow near the west end of the ponderosa pine forest site, along the Soda Pocket Campground access road in Soda Pocket Canyon, and in Soda Pocket Campground. Jones (2002) observed this species in the Colorado portion of the Sugarite Canyon area. Specimen records include Colfax and Union counties (Findley et al. 1975; Dalquest et al. 1990). The subspecies is *O. h. hemionus*.

***Odocoileus virginianus* (Zimmermann 1780)**
White-tailed Deer

White-tailed deer have been observed on only two occasions within Sugarite Canyon SP, including a male seen east of Lake Maloya near the Colorado border and a female seen near the visitors center (R. Dye, personal communication). Small, scattered populations of white-tailed deer occur in northeastern New Mexico

(including Colfax County) and southeastern Colorado, primarily in association with riparian areas (Findley et al. 1975; Fitzgerald et al. 1994; Dalquest et al. 1990). Dalquest et al. (1990) reported that numbers of this species might have increased in Union County. Jones (2002) considered this species possible for the area. The subspecies is *O. v. texanus*.

Cervus elaphus Linnaeus 1758
Elk

Elk have become established in Sugarite Canyon SP, and we observed a shed antler that was found in the park around 2001 (MacCarter 1993). Jones (2002) observed elk in the Colorado portion of the Sugarite Canyon area, although no specimens previously have been reported from eastern Colfax, Union, or Las Animas counties (Armstrong 1972; Findley et al. 1975; Dalquest et al. 1990). Elk are associated primarily with open grasslands and coniferous forests, although at Sugarite Canyon SP they also make use of montane scrub habitats. Two subspecies of elk were likely native to the Sugarite Canyon area, including *C. e. canadensis*, which likely occurred in the plains in southeastern Colorado and northeastern New Mexico, and *C. e. nelsoni*, which occurred in the Sangre de Cristo Mountains (Armstrong 1972; Hall 1981; Frey 2004). Presumably, native elk of both subspecies were extirpated prior to the introduction of *C. e. nelsoni* into the area beginning in 1911 (Dalquest et al. 1990). Sugarite Canyon SP elk are likely referable to the subspecies *C. e. nelsoni*.

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